National Transportation Safety Board **FACTUAL REPORT** **AVIATION**	NTSB ID: ENG06IA018	Aircraft Registration Number: N330AA
	Occurrence Date: 06/02/2006	Most Critical Injury: None
	Occurrence Type: Incident	Investigated By: NTSB

Location/Time

Nearest City/Place	State	Zip Code	Local Time	Time Zone	
Los Angeles	CA		1227	PDT	

Airport Proximity: On Airport	Distance From Landing Facility:	Direction From Airport:

Aircraft Information Summary

Aircraft Manufacturer	Model/Series	Type of Aircraft
Boeing	767-223(ER)	Airplane

Sightseeing Flight: No Air Medical Transport Flight: No

Narrative

Brief narrative statement of facts, conditions and circumstances pertinent to the accident/incident:

HISTORY

On June 2, 2006, at 1227 Pacific daylight time, an American Airlines Boeing 767/223(ER) was substantially damaged when the left engine, a General Electric (GE) CF6-80A, had an uncontained high-pressure turbine (HPT) stage 1 disk failure during a high-power ground run for maintenance on the ground at the Los Angeles International Airport (LAX), Los Angeles, California. In response to a write up by the pilots of the airplane's inbound flight to LAX that the left engine was lagging the right engine by about 2 percent during a climb from FL 360 to 380, maintenance personnel repositioned the airplane from the terminal to a run up pad to test the engine. The maintenance personnel on the airplane, after starting the engines, had accelerated both engines to maximum power with the electronic engine controls (EEC) ON. Although both engines were able to attain maximum power, left engine's power lever was about a full knob width further forward than the right engine's power lever. The maintenance personnel then turned the left engine's EEC OFF and made two idle-to-maximum power-to-idle power excursions. The mechanics on board stated that after the engine had attained maximum power and was decelerating the second time, they heard a loud bang that was followed by a fire on the left side of the airplane and a left engine fire warning in the cockpit. The maintenance personnel accomplished an emergency shutdown of the engines, discharged one fire bottle into the left engine's nacelle, and evacuated the airplane. Units from the nearby on-airport Los Angeles Fire Department fire station responded to the airplane and extinguished the fire within 20 seconds after they arrived on scene. The three maintenance personnel on board the airplane and two ground observers were not injured. Although the airplane and engines were substantially damaged, the Safety Board categorized this event as an incident rather than an accident because there was no intent for flight as defined by 14 CFR 830.2.

The examination of the left engine revealed that it had been cut in two at the HPT module with the front and rear sections of the engine hanging from the respective engine mounts. The HPT stage 1 and 2 disks were both missing from the engine. The HPT stage 2 disk was recovered essentially intact from the run up pad near the airplane. But the HPT stage 1 disk was found in four pieces that were recovered from the left engine's pylon, the belly of the airplane, the right engine's exhaust duct, and from a vacant lot, which was approximately 2,600 feet away from the airplane, on the south side of the airport across runways 7L/25R and 7R/25L. Liberated debris from the left engine resulted in numerous holes in the fuselage as well as the left and right wings that had numerous holes in the fuel tanks from where fuel leaked that fed the fire that burned the left wing and left side of the fuselage aft of the wing.

TESTS AND RESEARCH

The metallurgical examination of the broken pieces of the HPT stage 1 disk at the Safety Board's Materials Laboratory revealed the disk had failed from a radial rim-to-bore fracture that originated from an intergranular fatigue crack. The CF6-80A and -80C2 HPT stage 1 disk has 80

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Narrative (Continued)

blade slots. The fatigue crack initiated from a small depression in the aft corner radius of blade slot bottom No. 31. The examination of the disk also revealed that there were two other blade slots, Nos. 30 and 72, that had intergranular fatigue cracks that had also initiated from small depressions in the aft corner radius. Intergranular fatigue cracks are associated with very high stresses that exceed the material's capabilities. The examination of the disk confirmed the blade slots' aft corner radii conformed to the HPT stage 1 disk's engineering drawing requirements. In addition, the metallurgical examination determined the disk's hardness and grain structure conformed to the material's requirements. The cause of the disk burst was completely unrelated to the pilot's report of the engine being unable to make climb thrust.

The disassembly and examination of the engine did not reveal anything that could have caused the disk failure. A review of American Airlines' records on its two overhauls of the failed disk and on American Airlines' overhaul and repair procedures of CF6-80A and -80C2 HPT stage 1 disks in general did not reveal anything that could have caused the dents on the blade slot bottom aft corner radii from where the fatigue cracks initiated. In addition, a review of GE's CF6-80A and -80C2 HPT stage 1 disk manufacturing process and CF6-80A and -80C2 HPT module assembly procedure also did not reveal anything that could have caused the dents on the blade slot bottom aft corner radii.

Following a previous uncontained CF6-80C2 HPT stage 1 disk failure from a fatigue crack that originated in a blade slot bottom aft corner that occurred during a high-power run for maintenance and that was preceded by the finding of two -80C2 HPT stage 1 disks during routine overhaul inspection to have fatigue cracks progressing from the blade slot bottom aft corners, GE issued a service bulletin (SB) to inspect the CF6-80C2 HPT stage disk blade slot bottom aft corners. The SB was subsequently superceded with a SB that provided focused and enhanced inspection procedures to improve the probability of detecting a crack in the blade slot bottom aft corner area. However, the SBs only required the inspection to be accomplished when the HPT stage 1 disk was disassembled to the piece part level. When the FAA issued an airworthiness directive (AD) to mandate the inspections of the CF6-80C2 HPT stage 1 disks, the AD followed the SB and only required the inspection be accomplished when the HPT stage 1 disk was disassembled to the piece part level. GE then issued an SB that promulgated the focused and enhanced inspections being accomplished on the CF6-80C2 HPT stage 1 disks to the CF6-80A HPT stage 1 disks. Although SB required the CF6-80A HPT stage 1 disk inspections to be accomplished when the disk had been disassembled to piece part level, a CF6-80A HPT stage 1 disk was discovered to have a fatigue crack in a blade slot bottom aft corner shortly after the SB was issued. Following an in-flight uncontained failure of a CF6-80A HPT stage 1 disk from a fatigue crack that originated in a blade slot bottom aft corner, the FAA issued an AD to mandate the focused and enhanced inspection procedures for the CF6-80A HPT stage 1 disk blade slot bottom aft corners, but the AD only required the inspection to be accomplished when the disk had been disassembled to the piece part level. It was not until another CF6-80A HPT stage 1 disk was found to have a fatigue crack coming from a blade slot bottom aft corner that GE issued SBs for the CF6-80A and -80C2 disks that established a compliance schedule for the accomplishment of the focused and enhanced inspections of the blade slot bottom aft corners that the FAA mandated with an AD. Although the two previous disk failures had occurred at 7,547 and 12,485 cycles since new (CSN) and the five disks with cracks were found at 5,144, 9,532, 9,359, 9,058, and 9,459 CSN, the compliance schedule in the SBs and consequently the AD allowed the American Airlines HPT stage 1 disk that had 9,186 CSN when it failed to remain in service.

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Landing Facility/Approach Information

Airport Name	Airport ID:	Airport Elevation	Runway Used	Runway Length	Runway Width
Los Angeles	KLAX	Ft. MSL	NA		

Runway Surface Type:

Runway Surface Condition:

Type Instrument Approach: Unknown

VFR Approach/Landing: None

Aircraft Information

Aircraft Manufacturer	Model/Series	Serial Number
Boeing	767-223(ER)	22330

Airworthiness Certificate(s): Transport

Landing Gear Type: Tricycle

Homebuilt Aircraft?	Number of Seats:	Certified Max Gross Wt.	Number of Engines:
No	167	350000 LBS	2

Engine Type:	Engine Manufacturer:	Model/Series:	Rated Power:
Turbo Fan	General Electric	CF6-80A	46930 LBS

- Aircraft Inspection Information

Type of Last Inspection	Date of Last Inspection	Time Since Last Inspection	Airframe Total Time
		Hours	Hours

- Emergency Locator Transmitter (ELT) Information

ELT Installed?	ELT Operated?	ELT Aided in Locating Accident Site?

Owner/Operator Information

Registered Aircraft Owner	Street Address		
	City	State	Zip Code

Operator of Aircraft	Street Address		
AMERICAN AIRLINES INC	PO Box 619616		
	City	State	Zip Code
	DallasFt Worth Airport	TX	75261

Operator Does Business As: American Airlines

Operator Designator Code: AALA

- Type of U.S. Certificate(s) Held:

Air Carrier Operating Certificate(s): Flag Carrier/Domestic

Operating Certificate:

Operator Certificate:

Regulation Flight Conducted Under: Unknown

Type of Flight Operation Conducted: Non-scheduled; Domestic; Passenger Only

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First Pilot Information

Name	City	State	Date of Birth	Age

Sex: M	Seat Occupied:	Principal Profession:	Certificate Number:

Certificate(s):

Airplane Rating(s):

Rotorcraft/Glider/LTA:

Instrument Rating(s):

Instructor Rating(s):

Type Rating/Endorsement for Accident/Incident Aircraft?	Current Biennial Flight Review?

Medical Cert.:	Medical Cert. Status:	Date of Last Medical Exam:

- Flight Time Matrix	All A/C	This Make and Model	Airplane Single Engine	Airplane Mult-Engine	Night	Instrument Actual	Instrument Simulated	Rotorcraft	Glider	Lighter Than Air
Total Time										
Pilot In Command(PIC)										
Instructor										
Last 90 Days										
Last 30 Days										
Last 24 Hours										

Seatbelt Used?	Shoulder Harness Used?	Toxicology Performed?	Second Pilot?

Flight Plan/Itinerary

Type of Flight Plan Filed: None

Departure Point	State	Airport Identifier	Departure Time	Time Zone

Destination	State	Airport Identifier	

Type of Clearance: None

Type of Airspace:

Weather Information

Source of Briefing:

Method of Briefing:

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Weather Information

WOF ID	Observation Time	Time Zone	WOF Elevation	WOF Distance From Accident Site	Direction From Accident Site
			Ft. MSL	NM	Deg. Mag.

Sky/Lowest Cloud Condition: Ft. AGL		Condition of Light:
Lowest Ceiling: Ft. AGL	Visibility: SM	Altimeter: "Hg
Temperature: °C	Dew Point: °C	Wind Direction:
Density Altitude: Ft.		
Wind Speed:	Gusts:	Weather Condtions at Accident Site:
Visibility (RVR): Ft.	Visibility (RVV) SM	Intensity of Precipitation:
Restrictions to Visibility:		
Type of Precipitation:		

Accident Information

Aircraft Damage: Substantial	Aircraft Fire: Ground	Aircraft Explosion Ground

Classification:

- Injury Summary Matrix	Fatal	Serious	Minor	None	TOTAL
First Pilot					
Second Pilot					
Student Pilot					
Flight Instructor					
Check Pilot					
Flight Engineer					
Cabin Attendants					
Other Crew				3	3
Passengers					
- TOTAL ABOARD -				3	3
Other Ground					
- GRAND TOTAL -				3	3

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Administrative Information

Investigator-In-Charge (IIC)

Jim Hookey

Additional Persons Participating in This Accident/Incident Investigation: